

CLAIMS

1. Utility for reciprocal polarization with mutually complementary polarizing layers (cross-polarizer), distinguished by
 - 1.1 comprising at least three polarizing layers P_i ($i=1,2,3,\dots$), each of said layers possessing a normal vector N_i normal to P_i and a layer vector V_i coplanar to P_i , said V_i together with the optical axes of incidence and reflexion of P_i defining which directions of polarization of the electromagnetic radiation incident on P_i will be reflected (polarizing reflexion) resp. will transmit P_i (polarizing transmission) such that V_i together with the axis of reflexion of P_i span the plane of polarization of the reflected beam and V_i together with the axis of incidence of P_i span a plane, which is perpendicular to the plane of polarization of the transmitting beam,
 - 1.2 polarizing layers P_1 and P_2 being arranged along a first optical axis A_1 such that V_1 of P_1 together with A_1 span a plane E_1 that is perpendicular to the plane E_2 spanned by V_2 of P_2 and A_1 (designated by the term „mutual complementarity“ of P_1 and P_2),
 - 1.3 polarizing layers P_1 and P_3 being arranged along a second optical axis A_2 such that V_1 of P_1 together with A_2 span a plane E_3 that is perpendicular to the plane E_4 spanned by V_3 of P_3 and A_2 (designated by the term „mutual complementarity“ of P_1 and P_3),
 - 1.4 optical axes A_1 and A_2 intersecting in P_1 , cutting angle between N_1 and A_1 equalling cutting angle between N_1 and A_2 ,
 - 1.5 the polarizing layers being positioned such that in the light path a transmission at P_1 being coupled to a reflexion at P_2 along the axis A_1 and a reflexion at P_1 being coupled to a transmission at P_3 along the axis A_2 are coupled (designated by the term „reciprocal polarization“).
2. Cross-polarizing system according to claim 1, said polarization layers P_i being cartesian polarizers, characterized by having their polarization planes selectable independently from the plane of incidence,

and said polarization layers P_i being arranged in planes which are perpendicular to a common ground plane, and all said optical axes being coplanar to a common ground plane.

3. Cross-polarizing system according to claim 2,
said layer vector V_1 of P_1 and said layer vector V_2 of P_2 being perpendicular to each other.
4. Cross-polarizing system according to claim 3,
said polarizing layers P_2 and P_3 forming a common polarization layer.
5. Cross-polarizer system according to claim 1,
 - 5.1 comprising at least one right prism (with all lateral surfaces perpendicular to its footprint) with a triangular footprint composed of two right prisms (with all lateral surfaces perpendicular to the footprint) T_1 and T_2 each with an isosceles triangular footprint,
 - 5.2 the lateral surface of subprism T_2 inbetween the two subprisms carrying a cartesian polarization layer P_1 ,
 - 5.3 the lateral surface of subprism T_1 , which with a lateral surface of subprisms T_2 forms a common lateral surface of the compound prism carrying a cartesian polarization layer P_2 .
6. Cross-polarizing system according to claim 1,
containing at least a right prism (with all lateral surfaces perpendicular to its footprint) with an isosceles triangular footprint and the two lateral surfaces of equal size carrying mutually complementary polarizations layers.
7. Cross-polarizing system according to claim 1,
comprising an additional fourth polarization layer P_4 which together with said P_2 along a third optical axis A_3 and together with said P_3 along a fourth optical axis A_4 constitutes an additional cross-polarizer according to claim 1.

8. Cross-polarizing system according to claim 7,
polarization layers P1 and P4 having parallel layer vectors and being within a common plane E1, and the polarization layers P2 and P3 having parallel layer vectors and being within a common plane E2, and E1 and E2 having an intersection line where all four polarization layers meet.
9. Utility for reciprocal polarization with mutually complementary polarizing layers (cross-polarizer), distinguished by
 - 9.1 comprising two polarizing layers P_i ($i=1,2$), said layers each possessing a normal vector N_i normal to P_i and a layer vector V_i coplanar to P_i , said V_i together with the optical axis of incidence and reflection of P_i defining which directions of polarization of the electromagnetic radiation incident on P_i will be reflected (polarizing reflexion) resp. will transmit P_i (polarizing transmission) such that V_i together with the axis of reflexion of P_i span the plane of polarization of the reflected beam and V_i together with the axis of incidence of P_i span a plane, which is perpendicular to the plane of polarization of the transmitting beam,
 - 9.2 polarizing layers P1 and P2 being arranged along a first optical path S1, which is folded by n reflecting means ($n=1,2,3,\dots$) such that the plane E1, which is spanned by V_1 and the optical axis of S1 in P1, and the plane E2, which is spanned by V_2 and the optical axis of S1 in P2, have a correlation such that the mirrored plane $E1^*$, which is derived from E1 by successive reflexions at said n reflecting means, is perpendicular to E2 (designated by the term „mutual complementarity“ of P1 and P2),
 - 9.3 polarizing layers P1 and P2 being arranged along a second optical path S2, which may be folded by n reflecting means ($n=0,1,2,\dots$) such that the plane E3, which is spanned by V_1 and the optical axis of S2 in P1, and the plane E4, which is spanned by V_2 and the optical axis of S2 in P2, have a correlation such that the mirrored plane $E3^*$, which is derived from E3 by successive reflexions at said n reflecting means, is perpendicular to E4 (designated by the term „mutual complementarity“ of P1 and P2),
 - 9.4 said two optical paths S1 and S2 intersecting in P1 with equal cutting angles

- between N1 and S1 and between N1 and S2,
- 9.5 the architecture of the system coupling the transmission at P1 along S1 to a reflexion at P2 and the corresponding reflexion at P1 to a transmission at P2 along S2.
10. Utility for reciprocal polarization with mutually complementary polarizing layers (cross-polarizer), distinguished by
- 10.1 comprising at least three polarizing layers P_i ($i=1,2,3,\dots$), each of said layers possessing a normal vector N_i normal to P_i and a layer vector V_i coplanar to P_i , said V_i together with the optical axes of incidence and reflexion of P_i defining which directions of polarization of the electromagnetic radiation incident on P_i will be reflected (polarizing reflexion) resp. will transmit P_i (polarizing transmission) such that V_i together with the axis of reflexion of P_i span the plane of polarization of the reflected beam and V_i together with the axis of incidence of P_i span a plane, which is perpendicular to the plane of polarization of the transmitting beam,
- 10.2 polarizing layers P1 and P2 being arranged along a first optical path S1, which is folded by n reflecting means ($n=1,2,3,\dots$) such that the plane E1, which is spanned by V_1 and the optical axis of S1 in P1, and the plane E2, which is spanned by V_2 and the optical axis of S1 in P2, have a correlation such that the mirrored plane $E1^*$, which is derived from E1 by successive reflexions at said n reflecting means, is perpendicular to E2 (designated by the term „mutual complementarity“ of P1 and P2),
- 10.3 polarizing layers P1 and P3 being arranged along a second optical path S2, which may be folded by n reflecting means ($n=0,1,2,\dots$) such that the plane E3, which is spanned by V_1 and the optical axis of S2 in P1, and the plane E4, which is spanned by V_3 and the optical axis of S2 in P3, have a correlation such that the mirrored plane $E3^*$, which is derived from E3 by successive reflexions at said n reflecting means, is perpendicular to E4 (designated by the term „mutual complementarity“ of P1 and P3),
- 10.4 said two optical paths S1 and S2 intersecting in P1 with equal cutting angles between N1 and S1 and between N1 and S2,

- 10.5 the architecture of the system coupling the transmission at P1 along S1 to a reflexion at P2 and the corresponding reflexion at P1 to a transmission at P3 along S2.
11. Cross-polarizing system according to claim 10,
comprising an additional fourth polarizing layer P4, which together with said P2 along a third optical path S3 and together with said P3 along a fourth optical path S4 constitutes an additional cross-polarizer according to claim 10.
12. Cross-polarizing system according to claim 10,
at least one of said layers P_i being doubled or two-sided cartesian polarizer with parallel layer vectors V_i .
13. Cross-polarizing system according to claim 10,
all of said P_i being cartesian polarizers, e.g. wire grid polarizers.
14. Cross-polarizing system according to claim 10,
all of said P_i being thin-film polarizers working according to Brewster's law.
15. Cross-polarizing system according to claim 10,
all of said P_i contained in a body and the optical paths in and out of the cross-polarizing system made possible by windows or openings.
16. Utility for the light architecture in a two-channel display system, distinguished by
- 16.1 comprising at least one cross-polarizing system according to claim 10,
- 16.2 comprising at least one spatial light modulator in each channel,
- 16.3 one of said cross-polarizing systems being used to feed the spatial light modulators with polarized light.
17. Utility for the light architecture in a two-channel display system, distinguished by

- 17.1 comprising at least one cross-polarizing system according to claim 10,
 - 17.2 comprising at least one spatial light modulator in each channel,
 - 17.3 one of said cross-polarizing systems being used to superpose the modulated light from the spatial light modulators.
18. Utility for the light architecture in a two-channel display system, distinguished by
- 18.1 comprising a cross-polarizing system according to claim 10,
 - 18.2 comprising at least one spatial light modulator of the type micro-electro-mechanical-system (MEMS, e.g. DMD by Texas Instruments) in each channel,
 - 18.3 said cross-polarizing system being used to both feed the spatial light modulators with polarized light and to superpose the modulated light from the spatial light modulators,
 - 18.4 the plane of incidence in said P1 intersecting the plane of superposition with an angle different from 0deg.
19. Utility for the light architecture in a two-channel display system, distinguished by
- 19.1 comprising a cross-polarizing system according to claim 9,
 - 19.2 comprising at least one spatial light modulator in each channel positioned in said optical paths S1 and S2 between P1 and P2.
20. Utility for the light architecture in a two-channel display system, distinguished by
- 20.1 comprising a cross-polarizing system according to claim 15,
 - 20.1 comprising at least one spatial light modulator in each channel which is mounted to the body.
21. Cross-polarizing system according to claim 1,
- comprising at least one right prism (where the lateral surfaces are perpendicular to the footprint) with the footprint of a triangle, which is composed of two right sub-prisms with the footprint of an isosceles triangle

each, such that a thin-film type polarizing layer P1 is situated between these two sub-prisms, and the lateral surface of the compound prism that consists of two lateral surfaces of the sub-prisms, carries a cartesian polarizing layer P2 with the layer vector V2 perpendicular to V1.

22. Cross-polarizing system according to claim 1, comprising at least one right prism (where the lateral surfaces are perpendicular to the footprint) with the footprint of a triangle, which is composed of two right sub-prisms with the footprint of an isosceles triangle each, such that a cartesian type polarizing layer P1 is situated between these two sub-prisms, and the lateral surface of the compound prism that consists of two lateral surfaces of the sub-prisms, carries a cartesian polarizing layer P2 with the layer vector V2 perpendicular to V1.
23. Cross-polarizing system according to claim 1, comprising at least one right prism (where the lateral surfaces are perpendicular to the footprint) with the footprint of a triangle, which is composed of two right sub-prisms T1a, T1b with the footprint of an isosceles triangle each, such that those lateral surfaces of the compound prism, that consists of only one lateral surface of the sub-prisms, carries polarization layers P1 and P2.
24. Cross-polarizing system according to claim 1, made of at least one right prism (where the lateral surfaces are perpendicular to the footprint) with the footprint of a triangle, which is composed of two right sub-prisms with the footprint of an isosceles triangle each, such that a thin-film type polarizing layer P1 is situated between these two sub-prisms.
25. Cross-polarizing system according to claim 10, all cartesian polarizing layers being doubled or two-sided.